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(54) Banknote picker in automatic banking machines

(57) A banknote picker for extracting new and circulated paper money notes from stacks in ATMS, comprises a primary suction picker (42) and a secondary friction picker (68) which is selectively engaged with the suction picker (42) if an initial failure to extract a banknote occurs.

As shown, the primary suction picker (42) normally moves to the opening in the banknote container, to engage the banknote downwardly and outwardly; then upwardly to feed the banknote to conveyor rolls (98, 99) as in specification GB 2084969A. If the

primary suction picker (42) fails to engage a banknote during this movement the secondary friction picker (68) is latched to the primary suction picker (using latch plate (79) to lock arm (64) to plate (21)) so that during the repeated movement of the suction picker (42), the friction picker (68) drags the banknote (106) upwardly with the suction picker (42) from the front of the banknote stack. The latch plate (79) is moved into a position to lock the components together by solenoid plunger (37) engaging latch plate arm (94) so as to pivot it to the position illustrated. The friction picker (68) is a ribbed tyre mounted on a one-way clutch at the end of its support arm (64).

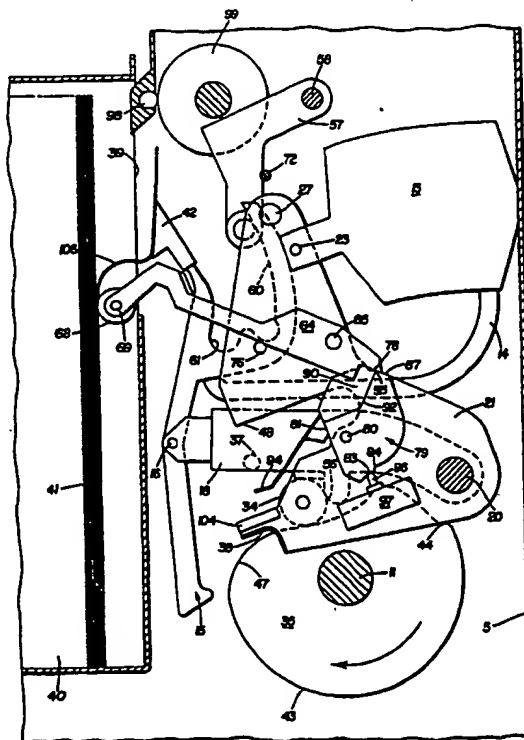


FIG. II

FIG. 1

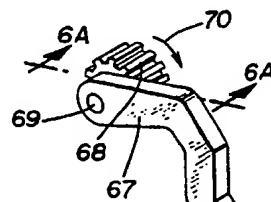
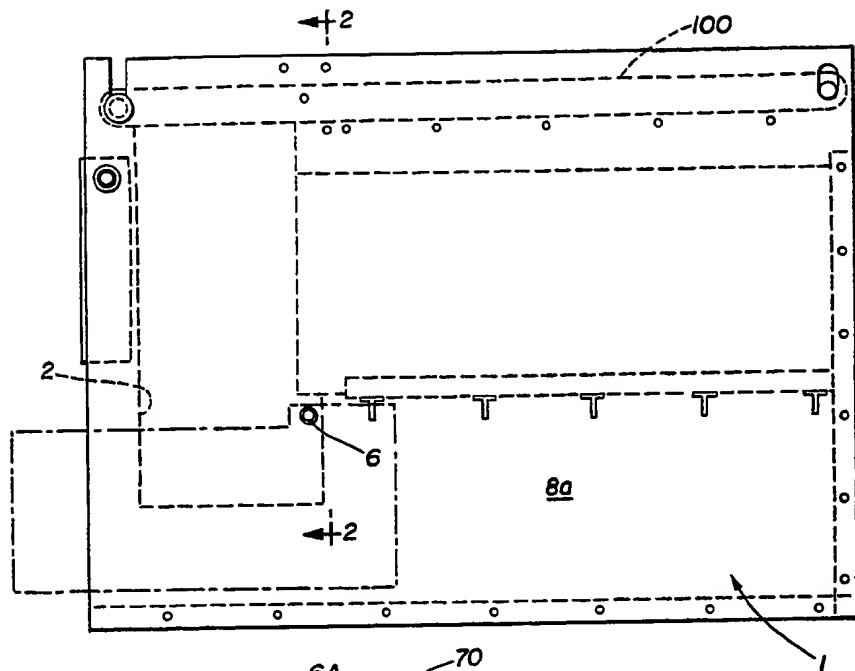


FIG. 6

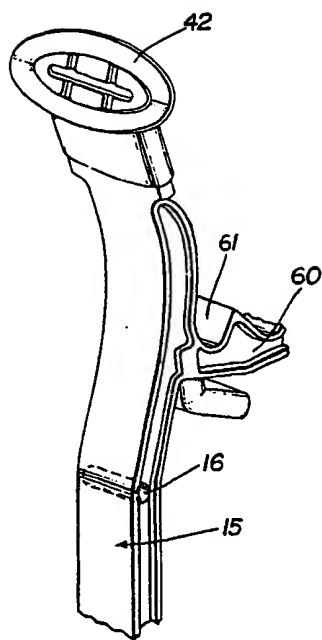


FIG. 5

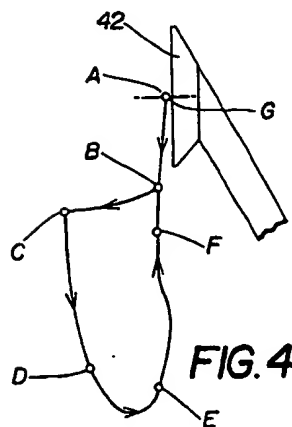


FIG. 4

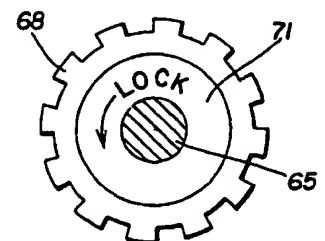


FIG. 6A

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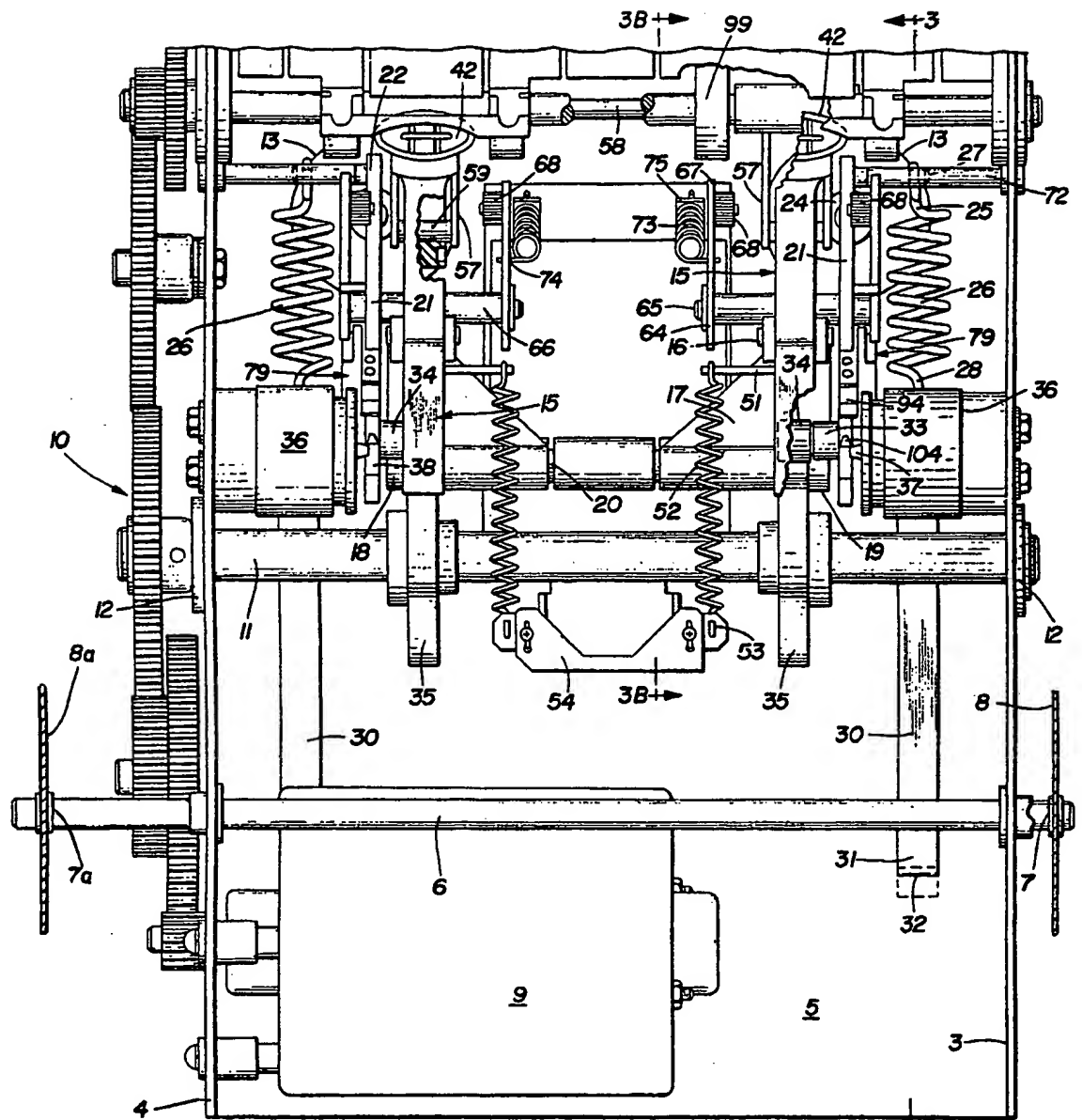


FIG. 2

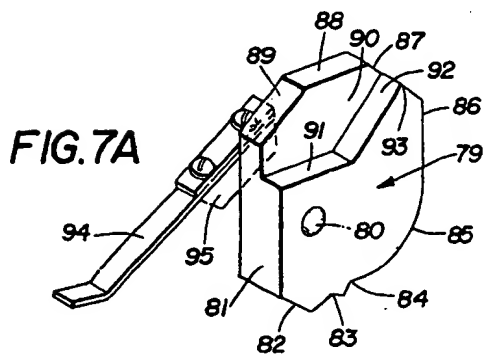


FIG. 7A

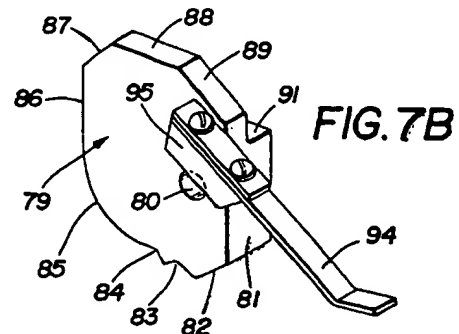


FIG. 7B

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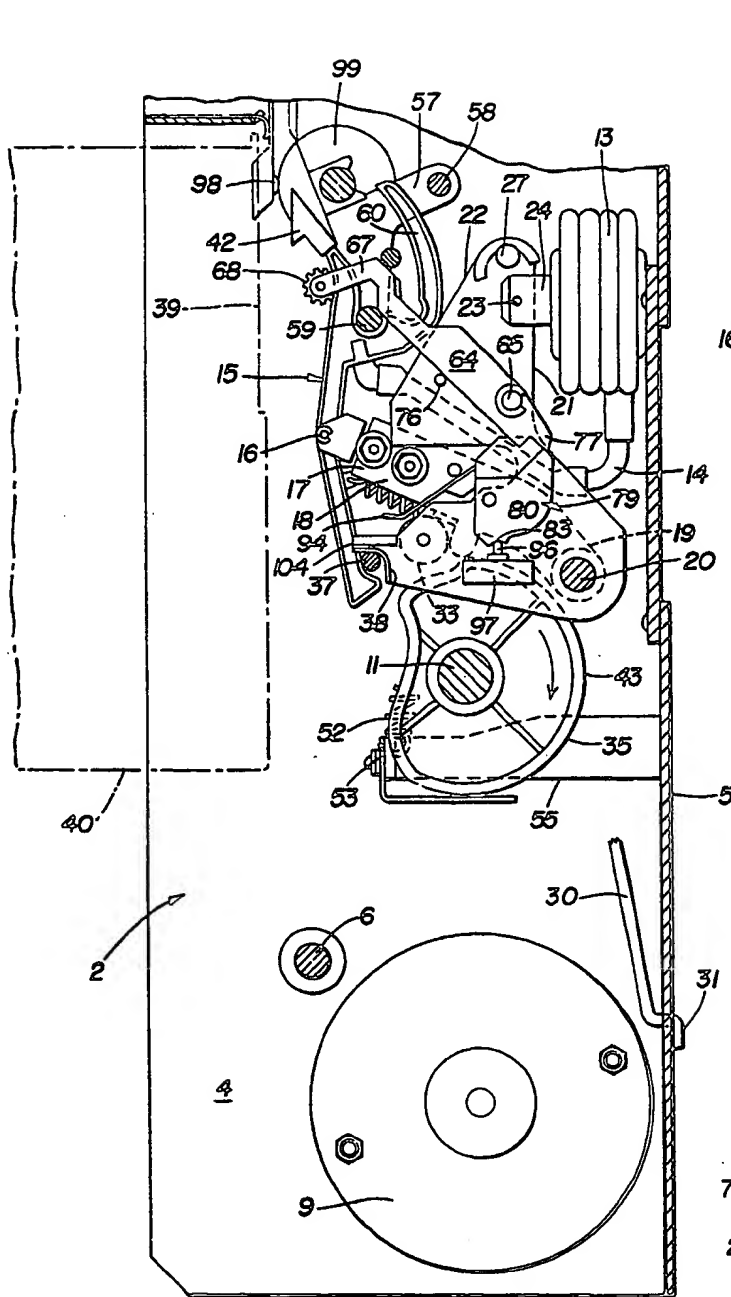


FIG. 3

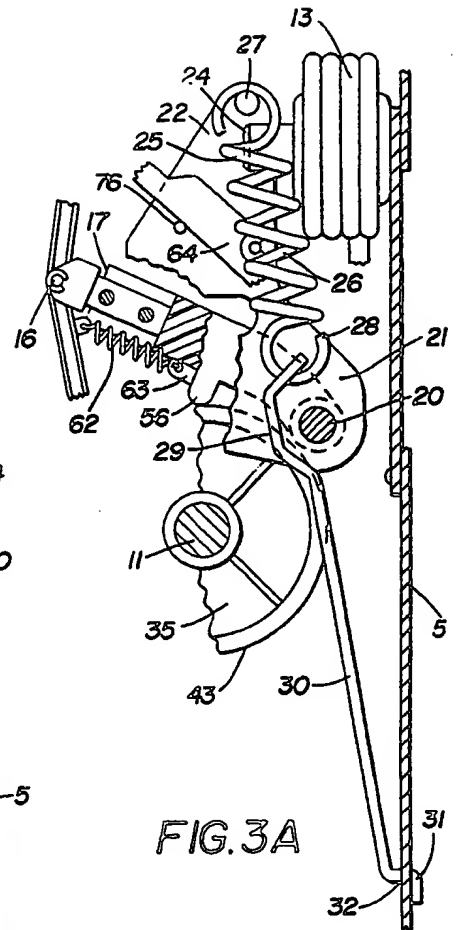


FIG. 3A

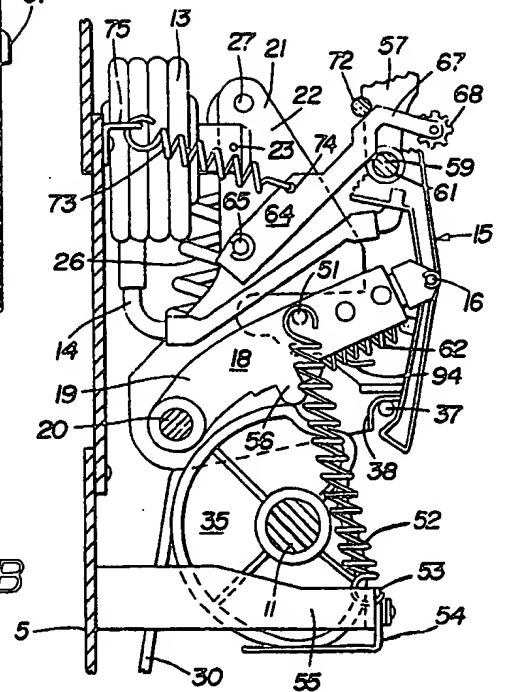


FIG. 3B

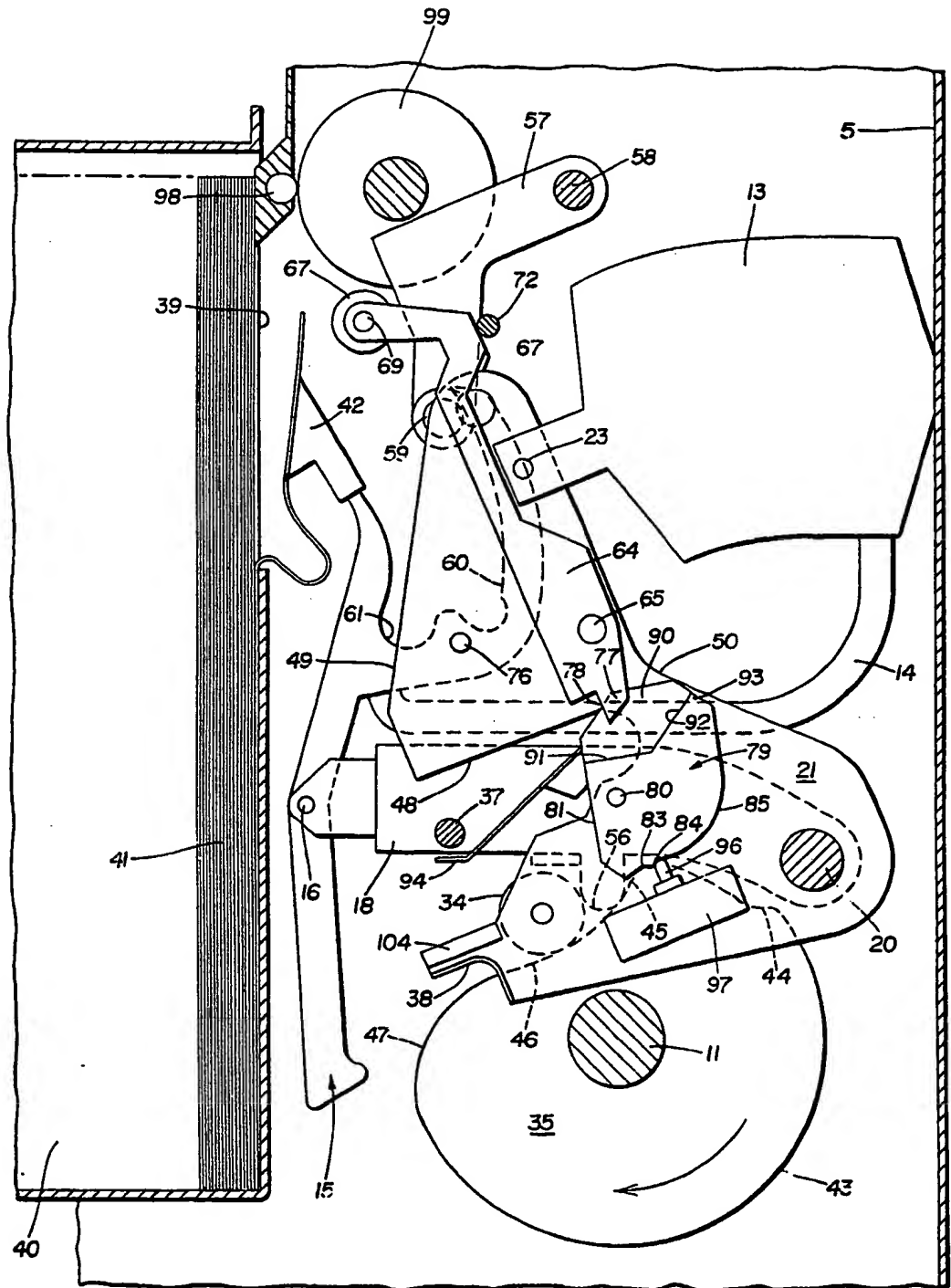
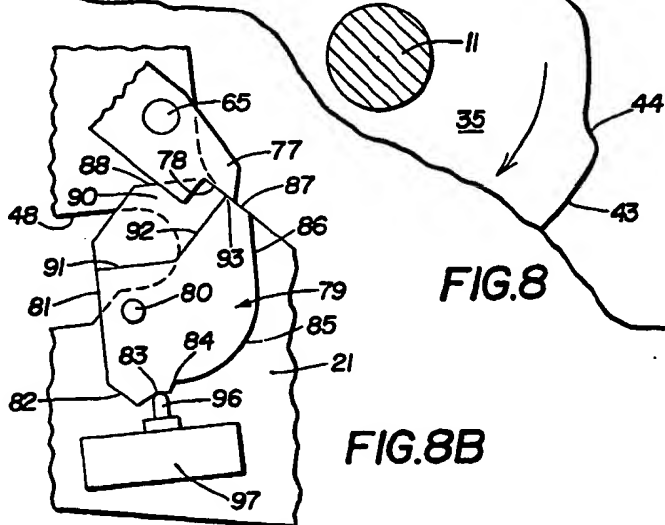
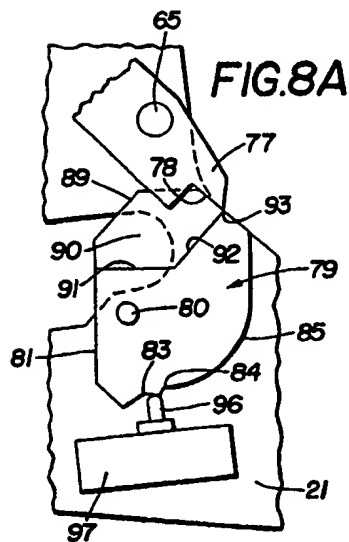
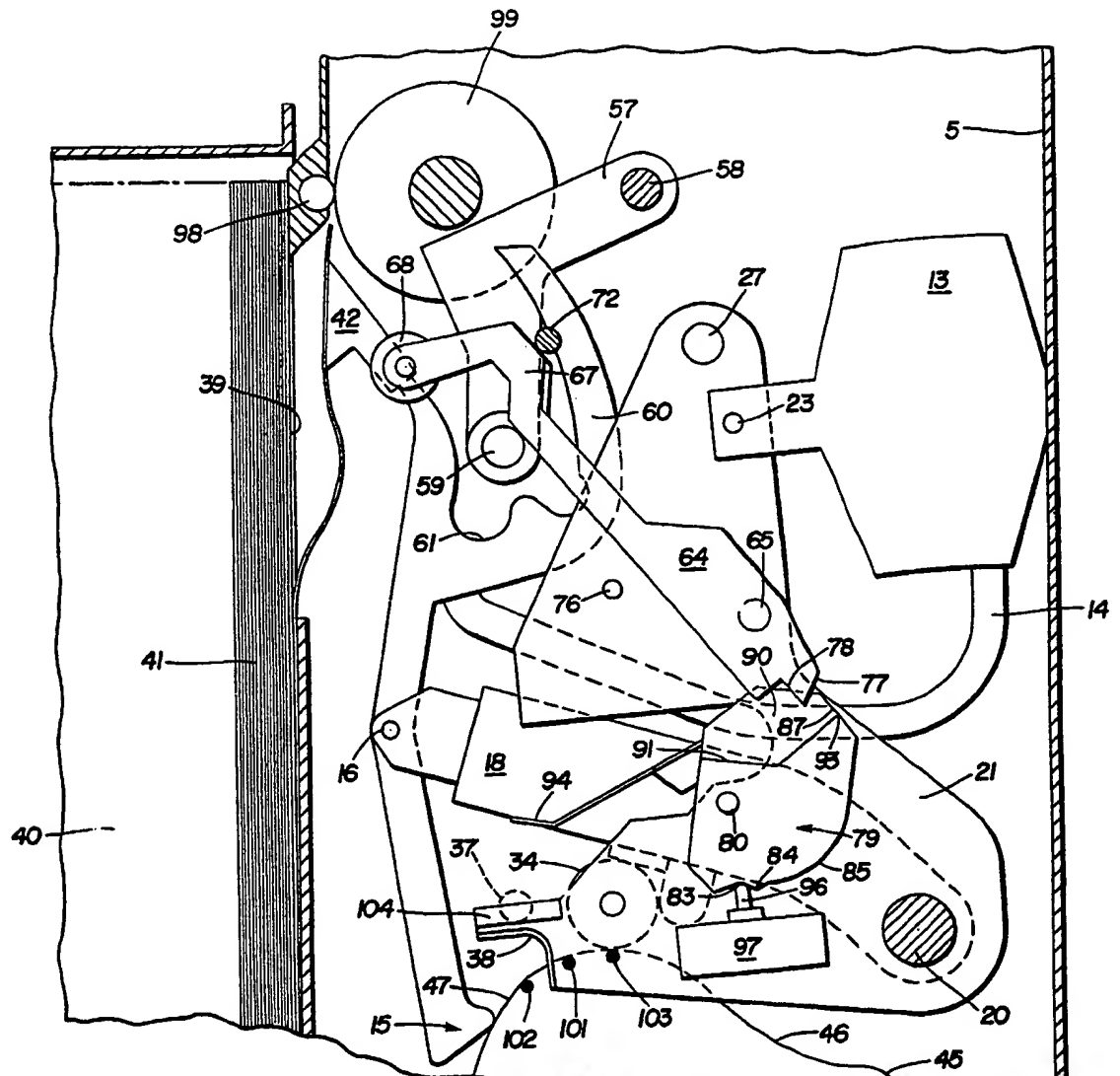


FIG. 7



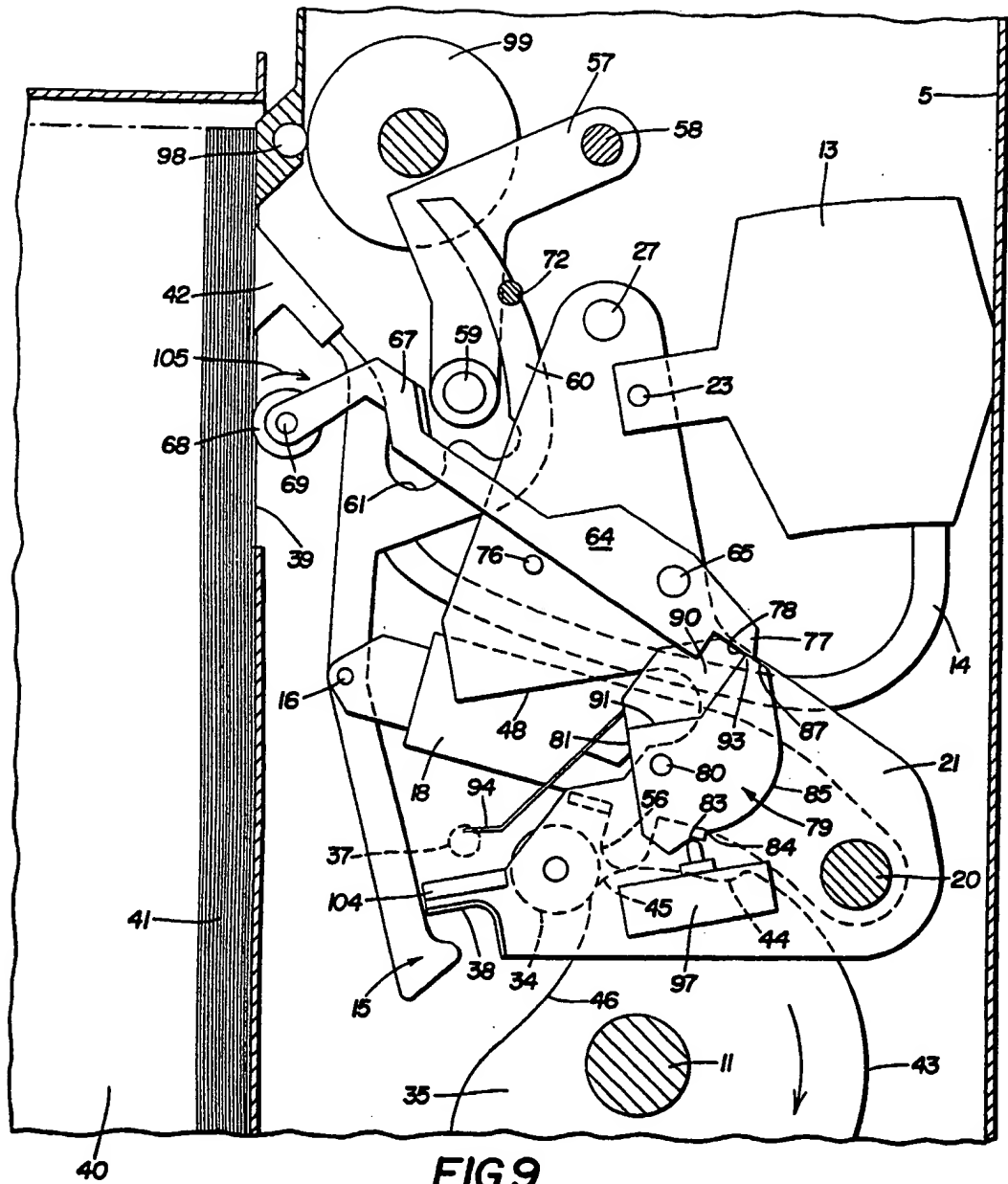


FIG. 9

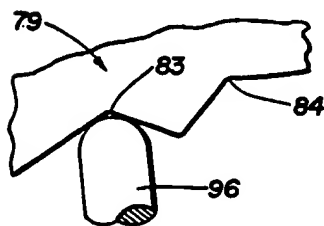


FIG. 8-1

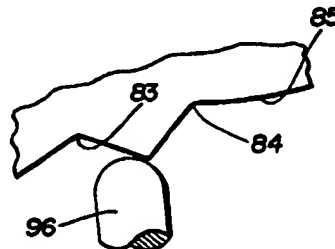


FIG. 8A-1

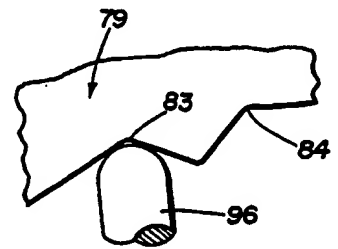


FIG. 8B-1

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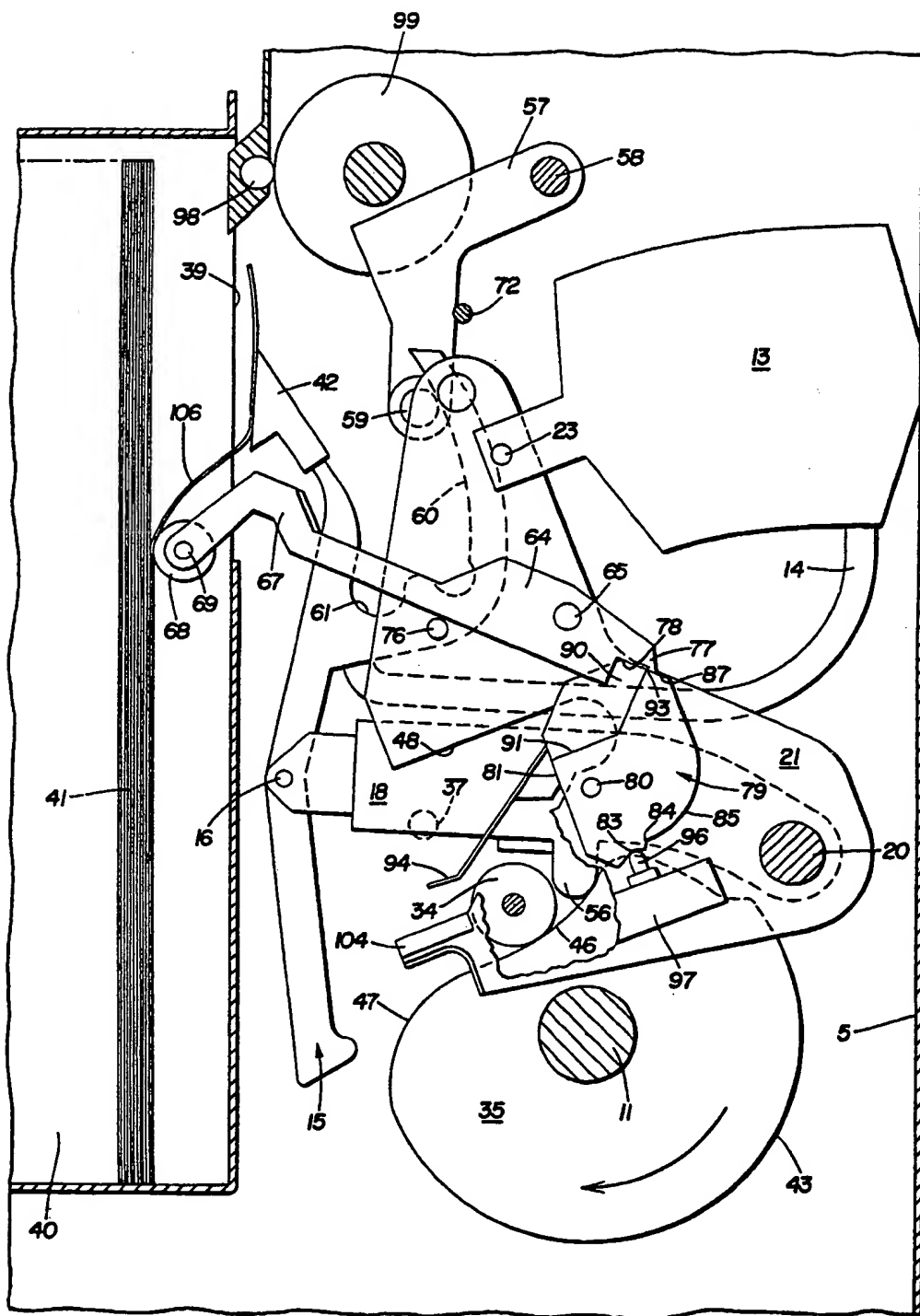


FIG. 10

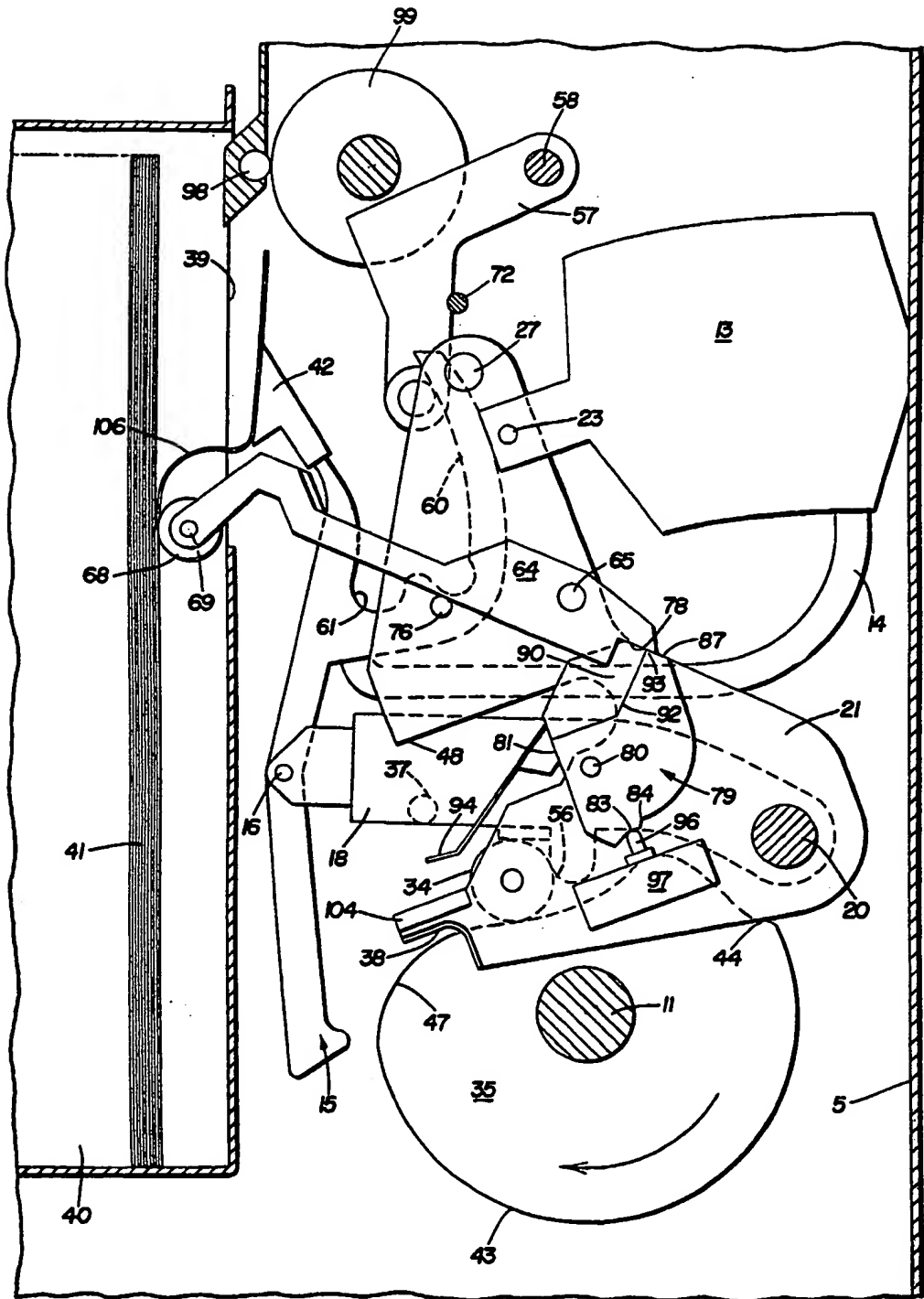


FIG. II

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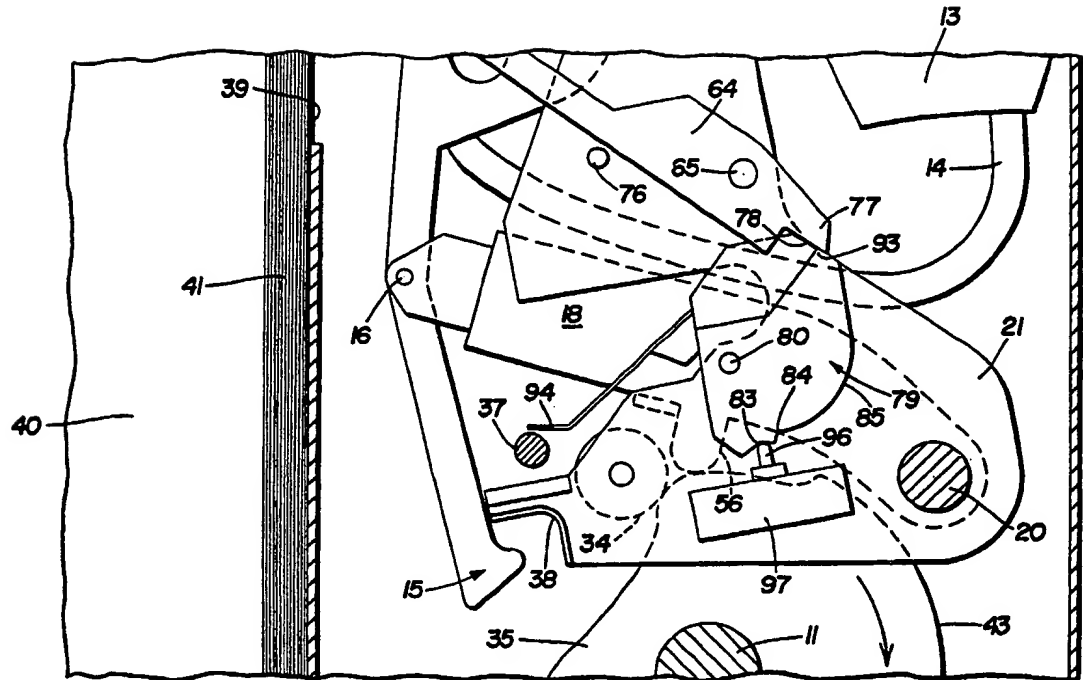


FIG. 12

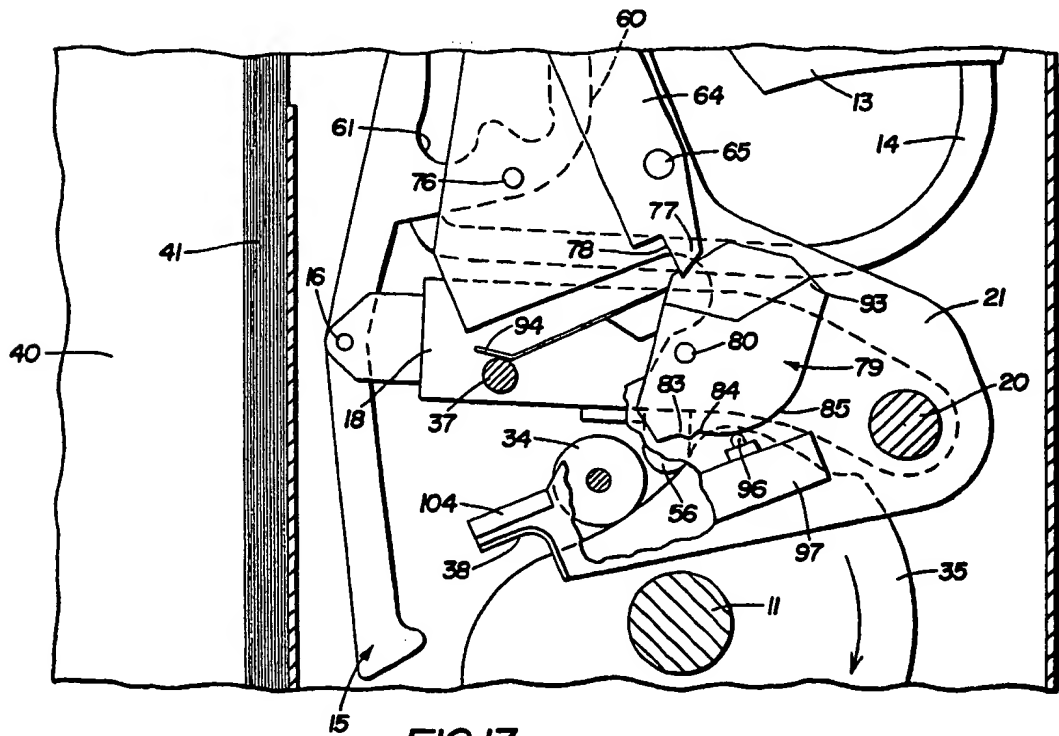


FIG. 13

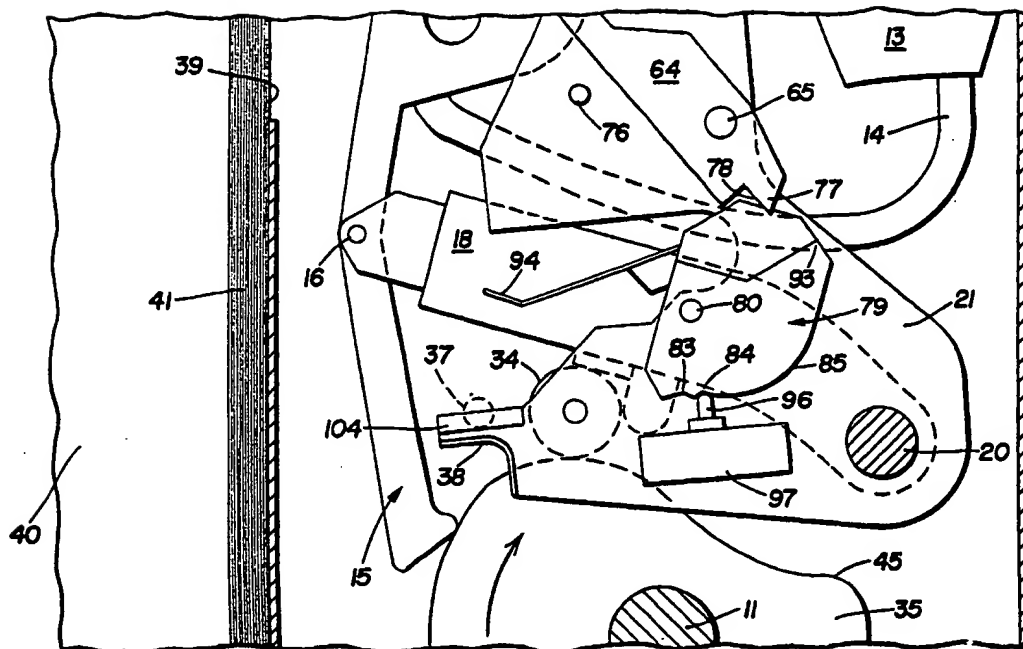


FIG. 14

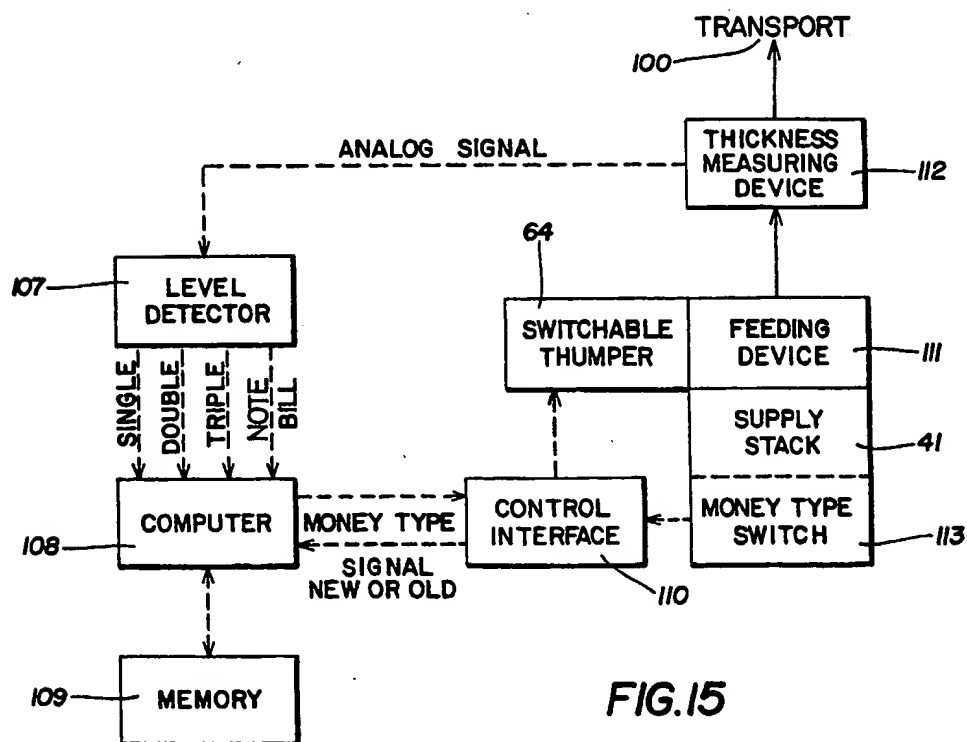


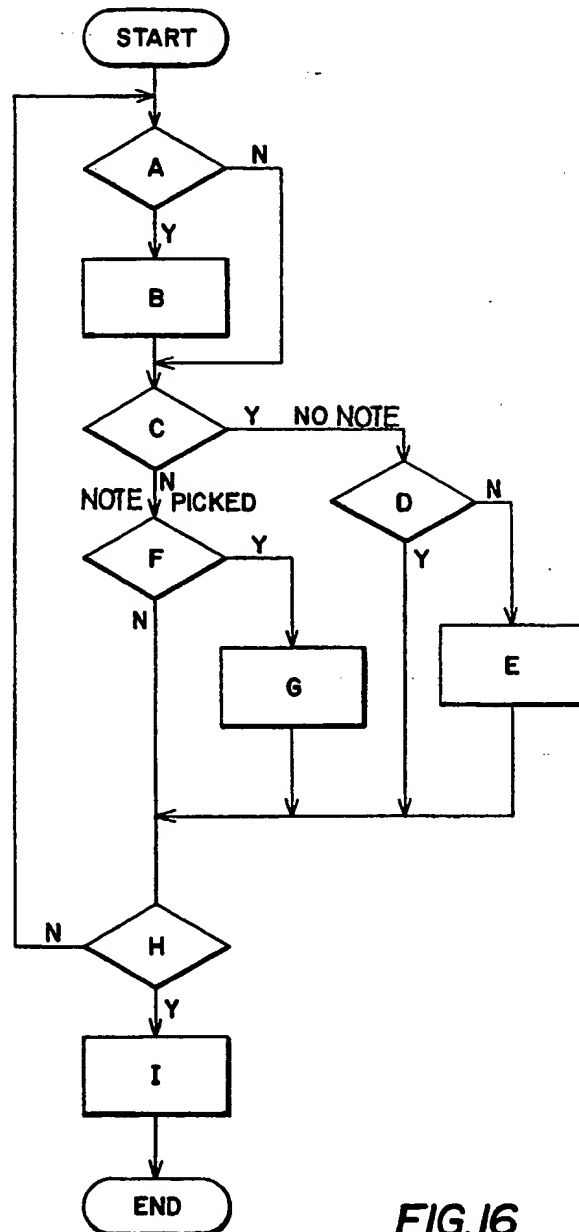
FIG. 15

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SIMPLIFIED

OLD SYSTEM NOTE FLOWCHART
SWITCHABLE THUMPER

◇ — DECISIONS
□ — ACTIONS



- A) IS THE SOLENOID OFF ?
- B) PULL SOLENOID, ACTIVATE FEED
- C) DOCUMENT NOT FED ?
- D) IS THE THUMPER ALREADY ON ?
- E) DROP SOLENOID AT TIME AND TURN ON THUMPER
- F) HAS THE THUMPER BEEN TURNED ON ?
- G) DROP SOLENOID AT TIME AND TURN OFF THUMPER
- H) HAS THE DESIRED NUMBER OF DOCUMENTS BEEN FED ?
- I) DROP SOLENOID AT TIME AND STOP FEEDING

FIG.16

SPECIFICATION

Improvements in or relating to picker mechanisms for automatic banking machines

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The present invention relates to automatic banking or teller machines (ATM's) and particularly to ATM's which may be installed in free-standing locations either remote from central banks or at locations accessible to customers in or adjacent central banks for dispensing paper money notes of one or more denominations.

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More particularly the present invention relates to a picker mechanism which picks notes one at a time from a sealed, tamper-indicating note container, which may be for example of the type described in our UK Patent Specification No. 1,584,235, through a container access opening when uncovered.

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A picker mechanism disclosed in our copending patent application No. 81 29864 (Publication No. 2,084,967 A) picks and withdraws paper money notes from a security note container through a rectangular container access opening smaller in at least one direction than the dimensions of the note being picked.

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However, it has been discovered in operation and use of the picker mechanism disclosed in our patent application No. 8129864 (Publication No. 2,084,967 A) that where the supply stack of paper money is composed entirely of newly issued paper money from which notes are picked one at a time through a rectangular access opening of the aforesaid size in a security note container in which the stack is confined under some pressure, it is frequently impossible for a suction cup picker head of the picker mechanism to dislodge, separate or peel from the supply stack the note exposed at the access opening from the next adjacent note in the stack. This results in picking failure. Further, it has been discovered that sometimes, when the picker mechanism is used to pick notes from a stack of circulated notes, and notes, for example, having very limp characteristics are encountered, the limp notes tend to crumple or bunch up, and frequently it is impossible for the suction cup to establish effective suction cup engagement with the limp note. This condition also results in a picking failure.

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According to one feature of the present invention a multi-picker mechanism for picking notes one at a time from a note supply stack in an ATM housing comprises a picker housing, primary picker means mounted in the picker housing, secondary picker means mounted in the picker housing and switchably engageable with or disengageable from the primary picker means, means for operating the primary picker means to pick notes from a note supply stack, and means enabled by the occurrence of a picking failure selectively to engage the secondary picker with or disengage the secondary picker from the primary picker means to re-establish picking operations.

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According to another feature of the present invention a multi-picker mechanism for picking notes one at a time from a note supply stack in an ATM housing includes a picker housing, primary picker means

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picker means mounted in the picker housing, means for operating the primary and secondary picker means in a first mode locked together to pick notes from a note supply stack, means for unlocking the secondary picker means from the primary picker means to operate said primary picker means alone in a second mode to pick notes from said note supply stack, and means for switching said secondary picker means from one mode to the other when a picking failure occurs during operation in said one mode.

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Preferably the primary picker means includes a suction cup means suction-engageable with an exposed note on the stack, the secondary picker means includes roller means frictionally engageable with said exposed note, and the suction cup means, and the roller means when operating, move toward and away from the stack combined with movement parallel with the surface of the exposed note during an operation of picking of an exposed note from the stack.

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According to yet another feature of the invention a multi-picker mechanism for picking notes one at a time from a note supply stack in an ATM housing, comprises a primary picker member having a suction type picker cup, a secondary picker member having a rubber tired roll rotatable in one direction only adapted frictionally to engage a note, means for selectively engaging the primary and secondary members for operation in unison or for disengaging the secondary member from the primary member so that the primary member acts alone to pick notes, means for moving the picker members in various directions with respect to the note surface of a note being picked to grip the note surface, to distort its shape, and to dislodge, separate and pull such note from the stack of notes of which it forms a part, and means for controlling the operation of said multi-picker mechanism to switch the mechanism from one of two operative modes to the other and vice versa, depending upon the type of notes being picked, when a picking failure occurs.

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According to still another feature of the present invention a picker mechanism for picking notes through an ATM note container access opening one at a time from a note stack held under pressure in said container, includes first suction picker means, second friction engageable picker means, lock means for said second picker means movable between locked and unlocked status, respectively to couple the second picker means to or to uncouple the second picker means from said first picker means, means actuated by a picking failure to move the lock means from locked to unlocked status and vice versa depending upon the status of the lock means when picking failure occurs, and means for actuating the first and second picker means and said lock means to pick notes from a note stack.

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According to a still further feature of the present invention a picker mechanism for picking notes from an ATM note container access opening one at a time from a note stack held under pressure in said container, comprises note engageable friction picker means including a lever arm, a lever pivot shaft, one end of the lever arm being fixed to said pivot shaft, a plate, means mounting the plate for movement

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toward and away from said stack, rubber tired roller means rotatably mounted on one-way clutch means on the other end of said lever arm, means pivotally mounting the pivot shaft on the plate, releasable means for locking the lever arm and pivot shaft against pivotal movement on the plate, and means for moving the plate toward and away from said stack, whereby movement of the plate, when the lever pivot shaft is locked against pivotal movement on the plate, toward said stack moves said pivot shaft toward said stack and moves the rubber tired roller means toward and through said access opening into the container to press said roller means against the stack pressure, and then moves the roller means along the stack in one direction along a note to be picked, and whereby subsequent movement of the plate away from said stack moves the roller means, frictionally engaged against the stack pressure with said note to be picked, in the other direction along the stack to strip said note from the stack and to move said note out of the container through the access opening as the roller means moves away from the stack.

Thus the present invention can meet a need which exists in the art for a picker mechanism which can re-establish normal picking operations of paper money notes confined in a security container as aforesaid, when the described types of picking failures occur, and which is intelligently controlled to recognize the picking failure encountered and to adjust or switch picker mechanism operation from one mode to another to eliminate the picking failure recognized.

From another standpoint, since picking failures frequently occur when picking notes one at a time from a stack of new paper money notes in a security container, it is desirable normally to operate the multi-picker mechanism in the first mode all of the time with the primary and secondary picker devices engaged or locked together and acting in unison so as to avoid a picking failure whenever notes that tend to stick together are encountered during picking. Further, when the multi-picker mechanism in the first mode, with primary and second picker devices engaged and acting in unison, is picking notes from a stack of new paper money notes and is involved in a picking failure, it has been discovered that disengaging the primary and secondary picker devices so that the mechanism operates in said second mode using the primary picker device only, can correct the picking failure and normal picking can then continue.

Accordingly, it is desirable, when a sealed container with a supply stack of new paper money notes is being installed in an ATM, to selectively predetermine the status of the mode of operation of the multi-picker mechanism so that the mechanism is set in its first operational mode when the installation in an ATM of a container having a stack of new paper money notes therein is completed.

Still another condition can arise where picking failures occur when picking notes one at a time from a stack of circulated notes with a random arrangement of notes in varying conditions of age, wear and stiffness or limpness located in a stack in a security container. Normally it is desirable not to operate the

multi-picker mechanism in the first mode, but picking operations of circulated notes should be carried out in the second mode wherein the secondary picker device is disengaged and not active, and picking is carried out by the primary suction cup picker device.

However, when picking of circulated notes is carried out in the manner described immediately above, and a picking failure occurs, operation of the multi-picker mechanism must be switched to the first mode which we have discovered can be effective to correct a picking failure when picking circulated notes. Such picking failure normally results from a very limp note bunching or crumpling up during picking so that suction engagement of the crumpled note by the primary suction cup picker device is not effective. When operation is switched to the first mode, the secondary picker device assists the primary picker device in re-establishing normal picking.

After normal picking operation of circulated notes has been reestablished, the multi-picker mechanism is switched back to the second mode of operation and normally so maintained until another picking failure is encountered.

Accordingly it is desirable, when a sealed container with a supply stack of circulated paper money notes with random arrangement of notes of variable age and wear characteristics is being installed in an ATM, to selectively predetermine the status of the mode of operation of the multi-picker mechanism so that the mechanism is set in its second operational mode when the installation in an ATM of a container having a stack of circulated paper money notes therein is completed.

A multi-picker mechanism embodying the present invention can be used for picking notes to be dispensed by an ATM from supply stacks of notes which stacks may be composed of note types differing in characteristics one stack from another such as new notes in one stack and circulated notes in another, since the mechanism is composed of a primary and a secondary picker device differing one from another in type of picking engagement, and the picker mechanism can have selective first and second modes of operation switchable one to the other, and vice versa, to restore normal picking when a picking failure occurs; such multi-picking mechanism can operate automatically to restore normal picking when picking failures occur of types that have been encountered in the operation of prior picking mechanisms, for example, a type of picking failure encountered when picking from a stack of new paper money notes, and a different type of picking failure encountered when picking from a stack of circulated notes. The multi-picker mechanism can be preset normally to operate in said first mode when a stack of new paper money notes is associated with the mechanism during installation of such stack in an ATM to be picked thereby, and can be preset normally to operate in said second mode when a stack of circulated paper money notes is associated therewith during installation of such pack in an ATM to be picked thereby.

The invention will be further described by way of example with reference to the accompanying drawings which illustrate a preferred embodiment of the

invention and in which:

Fig. 1 is a somewhat diagrammatic side view of an ATM equipped with the improved multi-picker mechanism,

5 Fig. 2 is a sectional view taken on the line 2-2 of Fig. 1 and to a larger scale illustrating, mostly in full lines but with certain parts broken away, various components of the multi-picker mechanism,

10 Fig. 3 is a sectional view taken on the line 3-3 of Fig. 2, showing the parts in the positions when a picking operation has just been initiated,

Fig. 3A is a view similar to portions of Fig. 3 with parts in the same position but some broken away and in section to illustrated constructional details not visible in Fig. 3,

15 Fig. 3B is a sectional view of the parts in Fig. 3 in the same position as in Fig. 3, but taken on the line 3B-3B of Fig. 2,

20 Fig. 4 is a diagrammatic illustration of the path of movement of a primary suction cup picker head member from the beginning to the end of a note picking operation,

Fig. 5 is a fragmentary perspective view of a portion of the primary suction cup picker member,

25 Fig. 6 is a fragmentary perspective view of a portion of a secondary picker member having a roll which frictionally engages a note when the primary and secondary picker members are engaged or locked together for operation in unison,

30 Fig. 6A is a sectional view to a larger scale along the line 6A-6A of Fig. 6 showing the secondary picker device rubber tire,

Fig. 7 is a diagrammatic view showing the position of certain of the picker mechanism components at a time when a solenoid controlled pin is actuated to cause the primary and secondary picker members to be locked together for operation in unison,

Fig. 7A is a perspective view of a latch plate, locating the latch plate generally in the same manner as shown in Fig. 7,

40 Fig. 7B is another perspective view of the latch plate looking at the back side thereof as related to Fig. 7A which shows the front side of the latch plate,

Fig. 8 is a diagrammatic view similar to Fig. 7 of the parts shown in Fig. 7 after a further small degree of clockwise rotation of the actuating cam,

Fig. 8A is a fragmentary view of certain portions of certain parts in Fig. 8 showing their changed relative positions after slight continued clockwise rotation of the control cam from the position in Fig. 8,

Fig. 8B is a view similar to Fig. 8A showing the changed relative positions of certain parts after a slight further rotation of the control cam from the cam positions of Figs. 8 and 8A,

55 Fig. 8-1, Fig. 8A-1 and Fig. 8B-1 are enlarged diagrammatic views of certain of the parts shown in Figs. 8, 8A and 8B, respectively,

Fig. 9 is another diagrammatic view similar to Figs. 7 and 8 showing the parts of the mechanism in their relative positions after the control cam has rotated through nearly one revolution from the position of the parts shown in Fig. 7, wherein the primary and secondary picker members are locked together and the secondary picker member has commenced to

65 move through its cycle of operation to perform a

picking function assisting the operation of the primary picker member,

Fig. 10 is a view similar to Figs. 7, 8 and 9 illustrating the parts after further clockwise rotation of the control cam from the position of Fig. 9, and illustrating the secondary picker member pushing against a stack of new paper money notes and moving them away from a sealed container access opening to peel the exposed note of the stack from other notes beneath,

75 Fig. 11 is a view similar to Figs. 7 to 10 showing further revolution of the control cam, and showing picker mechanism movement wherein the secondary picker member frictionally engages the note being picked to slide the engaged note upward along and relative to the stack, thus assisting the primary picker member in feeding the note to note conveyor mechanism,

Figs. 12, 13 and 14 are views showing operation of the solenoid controlled pin to release the locked status of the primary and secondary picker members thereby rendering the secondary picker member turned off or inoperative,

Fig. 15 is a block diagram illustrating a note status detector or sensor in the control system for operation of an automatic banking machine in which the multi-picker mechanism of the invention can be utilized, and

Fig. 16 is a system flow chart describing the general operation of the switchable secondary picker component of the multi-picker mechanism of the invention.

Similar numerals refer to similar parts throughout the various figures of the drawings.

A typical cash dispenser unit for an ATM is diagrammatically illustrated at 1 in Fig. 1 of the general type shown in our United Kingdom Patent Specification No. 1,584,235 loaded with two sealed, tamper-indicating note containers in the ATM housing generally of the type shown in our United Kingdom Patent Specification No. 2,001,038 A. The unit 1 has a multi-picker mechanism embodying the present invention mounted therein for withdrawing notes from the note containers and delivering such notes to the transport mechanism of the unit 1. Details of the picker mechanism and its construction, operation and control are shown in the remaining figures of the drawings.

The picker mechanism according to a preferred embodiment of the present invention includes components mounted in a picker housing 2 having side walls 3 and 4 and a closure wall 5. The housing 2 is pivotally mounted on a pivot shaft 6 the ends of the shaft being mounted at 7 and 7a on spaced frame members 8 and 8a of the dispenser unit 1.

The new multi-picker mechanism generally has a construction from a component standpoint similar to that disclosed in our copending patent application No. 81 29864 (Publication No. 2,084,967 A) but combined with a secondary picker member which may be engaged with or disengaged from the suction cup picker member disclosed in our prior Patent application No. 8129864, which suction cup member thus becomes the primary picker member of the multi-picker mechanism embodying the present invention.

130 A drive motor 9 for the picker mechanism is

mounted on the housing 2 and through gearing generally indicated at 10 has a driving connection with a cam shaft 11 journaled at 12 on the picker housing side walls 3 and 4.

5 Picker member components are provided for each note container, two of which have been indicated as being present on the unit 1. Only the components of one picker mechanism are described below since the set of components for one container is duplicated and operated by the same drive mechanism when notes are being dispensed from both containers. The picker mechanism at the right hand of Fig. 2 is described, the left-hand picker mechanism being composed of left-hand counterparts of those in the right-hand mechanism.

15 Picker mechanism components for any note container include (Figs. 2 and 3) a bellows 13 which is mounted on the housing wall 5. The interior of the bellows is connected by a tube 14, preferably flexible, with the interior of a hollow suction cup picker member 15 which is pivotally mounted intermediate its ends at 16 on one end 17 of lever 18, which lever 18 in turn is pivoted at its other end 19 on fixed bellows plate shaft 20 (Figs. 3 and 3B).

25 A bellows plate 21 also is pivotally mounted on the bellows plate shaft 20 and one corner 22 of the bellows plate 21 is pivotally connected at 23 with a connector member 24 projecting from the bellows 13. The upper end 25 of a tension spring 26 is connected with a pin 27 mounted on the corner 22 of bellows plate 21 and is connected at its lower end 28 to the upper end 29 of strip member 30 whose lower end 31 is interengaged with the closure wall through a slot 32 in the closure wall 5 of picker housing 2 (Figs. 2 and 3).

35 Bellows plate 21 has a control boss 33 projecting laterally therefrom at a triangular location remote from the bellows plate pivot shaft 20 and the bellows pivot connection 23. A cam follower roller 34 is journaled on a projecting end portion of boss 33 and normally engages picker control cam 35 fixed to and rotated by cam shaft 11 in a clockwise direction viewing Fig. 3. Bellows plate 21, unless restrained by means to be described, normally is urged to rotate in a counterclockwise direction, on bellows plate shaft 20, by spring 26 which exerts a strong pull in the bellows plate. Motion of the bellows plate 21 expands and collapses the bellows 13 to supply suction to the suction cup member 15.

A solenoid 36 is mounted on housing side wall 3 (Fig. 2) and has an armature pin 37 which is biased outward when the solenoid is de-energized, to project the pin 37 to a position (shown crosshatched in Fig. 3 and in full lines in Fig. 3B) beneath a notch 38 formed in a corner of the bellows plate 21 adjacent the control boss 33 and cam follower roller 34. The pin 37 is thus projected when the picking mechanism is not functioning and the ATM does not call for notes to be picked from a note supply; that is to say, when the picker mechanism is in an at-rest or "home" position as shown in Figs. 3, 3A and 3B. At the time when the pin 37 has been projected to engage in notch 38, the drive motor 9 stops, stopping further rotation of the cam 35 from approximately the position shown in Fig. 3.

65 When the parts are in this at-rest or "home"

position, and the ATM is called upon to dispense notes, motor 9 and solenoid 36 are energized. The solenoid retracts armature pin 37 permitting spring 26 to rotate bellows plate 21 counterclockwise to engage cam follower roller 34 with cam 35. The motor, at the same time, rotates cam 35 clockwise and a note is withdrawn by suction cup member 15 through an access opening 39 in a container 40 having a note supply 41 in a stack therein, as described in our copending patent application No. 8129864 (Publication No. 2,084,967 A).

70 The container 40, and access opening 39 are indicated in dot-dash lines in Fig. 3 but in full lines in Figs. 7 to 11. The path of travel of the suction cup head 42 of the suction cup member 15 is illustrated diagrammatically in Fig. 4.

75 The suction cup member 15 and related components, act as a primary picker device. One note is dispensed as called for during each revolution of the cam 35. The cam contour is such as to rotate the bellows plate 21 back and forth on its pivot shaft 20 to impart the necessary motion indicated diagrammatically in Fig. 4 to the picker suction head 42 which is supplied with suction from the bellows 13 as the bellows 13 is expanded and contracted by motion of the bellows plate 21 connected at 23 with the bellows connector member 24.

80 The peripheral surface of cam 35 has a contour, as shown, with a major circular surface segment 43 (Fig. 7), one end of which is formed with a short slight recess 44, followed by a lobe 45 which in turn is followed by a deep extended recess 46 connected by a lobe 47 which merges into the other end of the circular segment 43. The peripheral cam surface thus varies in radial distance from its axis of rotation in the zones described.

85 The bellows plate 21 has a large recess 48, generally wedge shaped, extending from its edge 49 and above the notch 38 toward the bellows plate edge 50. This recess 48 provides a space where there is located a latch mechanism which is described later and which controls engagement and disengagement of the primary and a secondary picker devices.

90 The lever 18 which links suction cup member 15 to the fixed bellows plate pivot shaft 20 (Fig. 3B) has a pin 51 to which a spring 52 is connected. The other end of the spring 52 is secured at 53 to a crosspiece 54 of a U-shaped bracket 55 mounted on the closure wall 5 of the picker housing 2 (Figs. 2 and 3B). Spring 52 biases lever 18 clockwise on pivot shaft 20 tending to pull suction cup member 15 downward (Fig. 3B). Such downward movement of member 15, however, is restrained by contact of cam follower nose 56 on the major circular surface segment 43 of cam 35 (Figs. 3, 3A and 3B).

100 A spaced pair of L-shaped brackets 57 are fixed to a shaft 58 which extends between picker housing side walls 3 and 4. A latch member 59 is mounted on and extends between the lower ends of L-shaped brackets 57. A hook member 60 is formed on and projects upward with respect to the upper end portion of member 15. An upwardly open socket 61 is formed by said hook member 60 as shown particularly clearly in Figs. 5 and 8.

105 The L-shaped brackets 57 straddle the hook mem-

ber 60 and the latch member 59 is seated and held seated in the socket 61 (Figs. 3 and 3B) when the member 15 is held upward by engagement of the cam follower nose 56 on lever 18 with the cam circular segment 43.

This latching of the member 15, in the position shown in Figs. 3 and 3B, restrains movement of the suction cup head 42 toward the note supply stack 41. The suction cup head 42, unless restrained, is urged to move toward the note supply 41 by counterclockwise movement on pivotal connection 16 biased by tension spring 62 connected to member 15 below pivot point 16 and to a projection 63 on lever 18 (Fig. 3A).

The secondary picker device includes a pair of lever arms 64 (Figs. 2 and 6, the lower ends of which are fixed to a lever pivot shaft 65 in U-shaped fashion; and the pivot shaft 65 is journaled within a tubular member 66 mounted on and extending laterally from the surface of bellows plate member 21 facing the suction cup member 15 which is straddled by the U-shaped or bifurcated arrangement of the arms 64 (Fig. 2).

The upper end of each arm 64 is formed with an angular probe 67. A moulded roller type rubber wheel or tire 68, with a serrated or grooved circumferential surface is journaled on a shaft 69 at the end of probe 67. The tire 68 is mounted on a oneway clutch 71 which intervenes between the tire and shaft 69 to allow rotation of the tire in one direction, clockwise as shown by the arrow 70 in Fig. 6, and to prevent counterclockwise rotation of the tire. The friction characteristics of the circumferential surface of the tire 68 and the serrations of grooves therein provide a very effective means of gripping a paper money note since the tire, when locked against rotation by the one-way clutch 71, engages the note and moves in a direction wherein the locked status of the tire prevents the tire from rolling on the note.

The tire 68 has been indicated as being formed of moulded rubber. The rubber formulation has high-friction characteristics and these characteristics are enhanced by the serrated or grooved surface of the tire. The one-way clutch 71 preferably is a product of Torrington Co. — Bearing Division, Torrington, Connecticut, United States of America, identified by Torrington Product Number DF 53460.

A pin 72 is mounted on and projects from housing side wall 3 (Fig. 2) across the path of movement of one of the arms 64 of the bifurcated arm assembly and stops clockwise rotative movement of the arm assembly clockwise as seen in Fig. 7. The arm assembly is biased to move toward the pin 72 by spring 73 (Figs. 2 and 3B) which is connected at one end to an arm 64 at 74 and at the other end to a bracket 75 mounted on the housing closure wall 5.

When the arm assembly 64 is rotated to a position shown in Figs. 9, 10 and 11 against the tension of spring 73 by other means to be described, its movement is limited by another pin 76 which is mounted on and projects from bellows plate 21. The tires 68, mounted on the probes 67 at the top of each arm assembly of arms 64, face each other or are mounted on shafts 69 which project toward one another as best shown in Fig. 2. At least one of the

arms 64, preferably the right-hand arm of the arm assembly at the right of Fig. 2, has a latch finger 77 forming a latch recess 78 at the lower end of the arm below the pivot shaft 65 as best shown in Figs. 7 to 11, the purpose of which is described below in connection with the description of a latch plate generally indicated at 79 and of its function and operation.

The construction of the latch plate 79 is best shown in Figs. 7A, 7B, 8A and 8B as well as in Figs. 2, 3 and 7. Latch plate 79 is pivotally mounted at 80 on the bellows plate 21. Viewing Figs. 7 and 7A, the latch plate has an irregular contour with a vertical edge 81 at the left, a lower edge with an angular corner 82 and two notches 83 and 84. Notch 84 extends to an upwardly curved surface 85 terminating in a vertical edge 86. The top edge of plate 79 has a truncated pyramid cross-sectional shape formed by angular surface 87 and top edge surface 88 and an angular surface 89 which connects with the upper end of vertical edge 81.

The major portion of each latch plate 79 has a thickness substantially twice the thickness of the arm 64 with the latch finger 77 and latch recess 78 at the lower end thereof with which the latch plate cooperates. The upper portion of latch plate 79 is cut away to have reduced thickness at 90 provided by the recessed edge formed by edge portions 91 and 92 which extend angularly from one another, edge portion 92 being perpendicular to angular upper edge 87. Thus, a square cornered latch detent 93 is formed between angular edges 92 and 87 extending from the surface of the reduced thickness portion 90 of the latch plate 79.

The portion of the latch plate 79 cut away above edges 91 and 92 to form the reduced thickness portion 90 provides a recess in which the latch finger 77 and latch recess 78 of arm 64 may overlap the latch plate reduced thickness portion 90 when the arm assembly 64 and latch plate 79 are pivotally mounted on the bellows plate 21.

A latch plate actuator strip 94, preferably somewhat springy, is mounted on a boss 95 extending rearwardly from the back side of the reduced thickness portion 90 of the latch plate. The mounting of the actuator strip 94 in this manner locates the strip within the large recess 48 in the bellows plate 21 in a manner in which the strip 94 can freely move within the recess to pivot the latch plate 79 relative to the bellows plate 21 for purposes to be described.

A spring-pressed latch plate control plunger 96, carried by box 97, is mounted on bellows plate 21 below the latch plate. Plunger 96 is engageable selectively with one or the other of the notches 83 and 84 on the lower edge of the latch plate 79.

A usual operation of picking a note from a note container access opening 39 with only the suction cup member 15 acting as a primary picker device proceeds as described below wherein the path of movement of the suction cup head 42 is illustrated in Fig. 4 and similarly in our copending patent application No. 8129864 (Publication No. 2,084,967 A).

The suction cup head 42 is normally at rest at position A (Fig. 4) and as shown in Fig. 3. When a picking operation is called for, the head 42 moves downward from position A to position B while

retained against movement toward a note supply stack by the interengagement of latch member 59 with the upwardly open socket 61. Movement also is imparted through the linkage system of lever 18 and suction cup member 15, and the operation of cam 35 and cam follower roller 34 on bellows plate 21 as well as the cam follower nose 56 on lever 18.

The head 42 then moves generally normal to the plane of the note exposed through access opening 39 from point B to point C. At point C the cup head 42 engages with suction an upper end portion of an exposed note. Cup movement then proceeds in a downward direction from point C to point D generally parallel with the plane of the exposed note in the note supply stack 41. During this movement the suction cup head 42 presses against the note stack and peels or drags an engaged note end downward relative to the access opening 39.

The head 42 then moves from point D to point E. This combines motion laterally away from the stack of notes in a direction normal to the stack, and the start of motion upwardly, in a direction opposite to that of the movement of head 42 from point C to point D. The head 42 continues to move upward from point E to point F, the location of the head 42 at point F being generally shown in Fig. 8.

Head 42 then completes its cycle of movement from point F to point G which coincides with point A, where the upper end of the note is engaged between conveyor rolls 98 and 99. The conveyor rolls and other conveyor means such as indicated at 100 in Fig. 1 then deliver the note to a dispenser station.

The note picking operation thus described immediately above performed by the primary picker device is an operation carried out in accordance with the disclosure in our patent application No. 8129864 (Publication No. 2,084,967 A) and also as contemplated by the present invention when picking notes from a supply stack of used or circulated paper money notes. During the described note picking operation, the bellows plate 21 moves on its pivot shaft 20 towards and away from the note supply stack 11 in accordance with movement of its cam follower roller 34 actuated by rotation of drive cam 35.

Frequently, when picking notes from a stack of circulated paper money notes, notes are encountered which are worn, quite old, limp, etc. and a picking failure occurs. In accordance with the invention, when such failure is sensed by means to be described, the programmed operation of the picking mechanism delivers a signal which de-energizes the solenoid 36 (which has been energized during the normal picking operation) thereby releasing or dropping its armature pin 37 at the position of the parts shown in Fig. 7, that is, at the position shown of the cam 35 and latch plate actuator strip 94. The solenoid pin 37 at this time is located at the position illustrated by a cross-hatched circle above the end of actuator strip 94 in Fig. 7.

As the cam 35 continues to rotate some 30 to 50 degrees from the position shown in Fig. 7 to that of Fig. 8, the bellows plate 21 rotates clockwise on its pivot shaft 20 to the position shown in Fig. 8 carrying with it the latch plate 79. As the latch plate moves upward, the end of springy strip member 94 carried

by the latch plate 79, wipes or sweeps across the end of solenoid armature pin 37 (Fig. 2). During such wiping interaction between the end of strip member 94 and spring-biased solenoid pin 37, the pin 37 moves strip member 94 to rotate latch plate 79 a slight distance counterclockwise on its pivot mounting 80 to reset the latch plate 79 to its arm 64 locking position shown in Fig. 8. The spring-pressed plunger 96, which controls the locking or unlocking positions of the latch plate 79, is reset from engagement with notch 84 in Fig. 7 to locking position notch 83 in Fig. 8. The parts with the latch plate thus reset are now in a position so that the latch plate 79 will lock the arms 64 in an operative position during further cam 35 rotation described below.

Meanwhile, the suction head 42 is in the position shown in Fig. 8 and the arms 64 are also in the position of Fig. 8 held against pin 72 by spring 73 (Fig. 3B).

During continued rotation of cam 35 from the position of Fig. 8, cam follower roller 34 rides along cam lobe 47 which curves to circumferential segment 43 (having a maximum diameter). Points 101 and 102 on cam lobe 47 are located at increasing radial distances away from the centre of the cam shaft 11 and also at greater radial distances than the distance that point 103 is radially spaced from cam shaft 11, point 103 being the point of contact of cam follower roller 34 with the cam lobe 47 in Fig. 8.

As roller 34 rides from point 103 to point 101, bellows plate 21 is raised and arms 64 held by pin 72 rotate counterclockwise slightly relative to their pivot shaft 65 on plate 21 to relocate the arm catch finger 77 to the position shown in Fig. 8A. The square corner latch detent 93 is also relocated slightly as the corner 93 rides along the outer surface of finger 77 to move latch plate 79 slightly, so that plunger 96 tends to try ride out of lock notch 83. As roller 34 continues to ride along cam lobe 47 to point 102, the various parts assume the position shown in Fig. 8B wherein the detent 93 engages in latch recess 78 at the lower end of arm 64 locking the arm assembly 64 in operative position.

The slight movement of the latch plate 79 and the relative positions of the notches 83 and 84 and the plunger 96 in Figs. 8, 8A and 8B are shown, respectively, in the diagrams of Figs. 8-1, 8A-1 and 8B-1 which are to a larger scale.

As bellows plate 21 raises during movement of roller 34 on lobe 47 from point 103 to point 102 and beyond, the upper wedge surface 104 of the projection forming the notch 38 in bellows plate 21 rides across the rounded end of solenoid outward biased armature pin 37 (Fig. 2). The location of pin 37 is indicated in dotted lines in Fig. 8. During revolution of the cam 35, from the position of Fig. 8 to the position of Fig. 9, the solenoid 36 is energized, retracting its armature pin 37. The relative position of pin 37 with respect to the remaining parts also is shown in dotted lines in Fig. 9.

The arm assembly 64 having been locked to the latch plate 79 and thus to the bellows plate 21 in operative position during initial movement of the cam 35 from the position of Fig. 8 to that of Fig. 9, as described in connection with Figs. 8, 8A and 8B, said

assembly 64 moves downward and its tires 68 engage a note exposed at container access opening 39 and start to roll downward thereon as shown in Fig. 9. The one-way clutch 71 permits the tire 68 to rotate in the direction of the arrow 105 shown in Fig. 9 as the tire moves down parallel with the surface of the exposed note.

As cam rotation continues from the position of Fig. 9 to that of Fig. 10, the arm assembly 64 presses inward into the container 40 through the access opening 39, and continues to roll downward along the exposed paper money note 106. Meanwhile, the suction head 42 suction-engages the note 106 above the tire 68 and arm assembly 64, as shown in Fig. 10, if the condition of the note 106 permits such suction-engagement following the picking failure that caused the arm assembly 64, as a secondary picker device, to be locked to and cooperate with the primary picker device (suction cup member 15 and related components).

As cam 35 continues to rotate from the position of Fig. 10 to the position of Fig. 11, the angular probes 67 on the ends of arms 64 start to move upward but the one-way clutches 71, on which the tires 68 are mounted, lock the tires against rotation and the tires frictionally engage the note 106 and pull it upward relative to the note supply stack 41 thus assisting the primary picker suction head 42 in picking the note 106 from the note supply 41.

Briefly summarising the described operation of the secondary picker assembly 64 during a revolution of the drive cam 35, the bellows plate 21 with the pivot shaft 65 of assembly 64 locked thereto initially moves towards the note supply stack 41 as does the rubber tired roller 68. Roller 68 moves through the access opening 39 into the container 40 and presses against the stack pressure (Fig. 9), and then moves along the stack in one direction pressed against a note to be picked (Fig. 10). Subsequently, movement of the bellows plate 21 away from the stack moves the roller 68, frictionally engaged with the note to be picked against the stack pressure, in the other direction along the stack (Fig. 11) to strip the note from the stack and to move the note out of the container 40 through the access opening 39 as the roller 68 moves away from the stack back to the position of Fig. 8.

The picking mechanism of the invention utilizing combined operation of the primary and secondary picker devices 42, 68 continues to pick notes from the stack when called upon to dispense notes so long as the latch mechanism maintains the arm assembly 64 locked to the latch plate 79.

Actually, when a picking operation is performed, the cam shaft 11 and cam 35 are rotating very rapidly so that the secondary rubber tired picker device 68 thrusts, pounds or thumps into and out of the container toward and away from the stack of notes equally rapidly and such repeated thumping of the exposed note on the stack continues to facilitate picking and to aid the suction head 42 to act in the intended manner.

As picking operations continue with respect to a stack of circulated paper money notes in accordance with the above description wherein a picking failure initiated locking the secondary picker device to the

primary picker device, if a picking failure again occurs, unlocking or disengagement or disabling of the secondary picker device arm assembly 64 is initiated. The picking failure is sensed and the programmed operation of the picking mechanism delivers a signal which again de-energizes the solenoid 36 thereby releasing or dropping its armature pin at the position of the parts shown in Fig. 12 where the pin is illustrated by a cross-hatched circle just below the end of actuator strip 94, the arm assembly 64 still being locked to latch plate 79.

As the cam 35 continues to rotate to the position of Fig. 13, the pin 37 engaging actuator strip 94 from below causes latch plate 79 to rotate clockwise on the bellows plate 21 thereby disengaging the arm assembly 64 and releasing the arm assembly to return to stop pin 72 biased by spring 73 (Fig. 3B).

The secondary picker device arm assembly 64, and its friction tires 68 being disabled, permits picking to proceed with only the primary suction head 42 operative.

In Fig. 13, as the actuator strip 94 is moved by the armature pin 37, the latch plate is moved considerably past the off-position of the latch plate so that the plunger 96 rides along the up-curved surface 85 of the latch plate. At this time the solenoid 36 again is energized to retract the pin 37 which permits the latch plate 79 to move back to its off-position with the plunger 96 seated in the off-notch 94 as shown in Fig. 14 where the latch plate has sprung back to the normal unlatched position.

For convenience in describing the control system for the operation of the primary-secondary picker mechanism which picks notes from a supply stack thereof to be dispensed by an ATM, the arm assembly 64, its rubber tires 68 mounted on one-way clutches 71, its mounting on the bellows plate 21 and its related latch mechanism 78 to 93 are termed a "switchable thumper", the thumper, or secondary picker device, is associated with the suction cup member 15 or primary picker device which has the suction head 42. The thumper is switched between engagement with or disengagement from the suction member 15 whenever a picking failure occurs.

In a first mode of operation, the thumper is locked to the suction member 15 to act in unison in picking notes. In this mode the thumper is said to be "on". In a second mode of operation, the thumper is disengaged from the suction member 15 and is said to be "off". Accordingly, the thumper is referred to as a switchable thumper because it is switched from "on" to "off", or from "off" to "on", depending upon the particular mode of operation whenever a picking failure occurs during such operation.

The basic control system block diagram of Fig. 15 is a modification of the block diagram of the ATM note-dispensing equipment having a note status detector illustrated in Fig. 1 of our copending patent application No. 8227248. The modification involves adding the switchable thumper 64 to the diagram, adding a "no note" signal from the level detector 107 to the computer 108, and adding a "money type" signal from the money type switch 113 to the computer 108.

The system disclosed in our copending patent

application No. 8227248 is used for detecting note status, etc. in the operation of the ATM cash dispensers 1 provided with the switchable thumper.

The main intelligence device of the control system 5 is the computer 108 which preferably is a conventional microprocessor (MP) responsive to programming and data stored in memory 109. Computer 108, which is preferably a standard type 8080 microprocessor programmed by information stored in memory 109, 10 transmits control information to the control interface 110 and receives data of single notes, double notes and triple notes from the level detector 107 as well as "no note" data. It also receives data of what type of money the supply stack contains, old notes or new 15 notes, from the money type switch 113 which is integral with the supply cassette. This switch is set by personnel loading the supply cassette. The level detector 107 measures the thickness of the note and classifies it as a single note, double note, triple note, 20 or no note. The control interface 110 cooperates to actuate the switchable thumper 64. The switchable thumper 64 is an integral part of the feeding device 111 which picks notes. The supply stack of notes 41 is another integral part of the feeding device 111. The 25 feeding device checks notes which are measured at the thickness measuring device station 112 before the notes go on to the conveyor system transport 100. The thickness measuring device 112 sends an analog signal which has voltage proportional to the note 30 thickness to the level detector 107. The level detector examines the analog signal and determines whether it is "no note", single note, double note, or triple note. If the level detector 107 indicates "no note" passing, the thumper is energized. The no note 35 information goes to the computer 108, the computer goes through the flow chart of decisions (Fig. 16), passes appropriate information to the control interface 110 to selectively engage or disengage the switchable thumper 64, that is, to establish an "on" or 40 an "off" status of the switchable thumper 64.

The flow chart of Fig. 16 illustrates the routine for control of the switchable thumper during picking of old notes. Programming of the computer 108 to provide control in accordance with this routine is 45 preferably provided by firmware or information stored in the memory 109 in a conventional manner. This type of programming is particularly useful in a microprocessor environment as preferred herein; other types of computers, such as larger general 50 purpose, software programmed systems could be used, however. The start point is a command to pick a note. The first matter checked at program step A is to determine if the solenoid 36 is off or de-energized. The solenoid controls the feeding of notes. Since 55 there is a command to feed notes, and the solenoid is off, the first action is to pull the solenoid at step B; that is, to energize the solenoid 36 and retract the armature pin 37 and to activate feed, that is energize drive motor 9.

60 Next is a check at step C — if a document was not fed. If there has been a picking failure, the "yes" answer at step C indicates "no note". Step D then questions, "Is the thumper already on?" If the answer at step D is "no", the thumper must be turned on and 65 this is done at step E by dropping the solenoid pin 37

by de-energizing the solenoid 36 at the time shown in Fig. 7 that turns the thumper "on".

A note is fed by the combined action of the thumper and suction head 42 and at step H the question is asked, "Has the desired number of documents been fed?" Assuming that the answer is "no", and that 70 more notes are desired, returning to step A the routine is repeated until the desired number of notes has been fed.

75 The flow chart of Fig. 16 relates primarily to programming when old notes in a stack are being picked. It was necessary to switch the thumper "on" following a picking failure just described in order to correct conditions causing the picking failure. Once 80 the thumper is turned "on" it will remain in this state until further action is taken. However, it has been found in picking old or circulated notes that the thumper should not be maintained "on" continuously after use to correct a picking failure.

85 Thus, in returning to step A to dispense additional notes, it is not intended that the thumper should remain "on" if a note has been picked. The routine proceeds at step A with determining whether the solenoid is "off". The answer is "yes" and at step B 90 the solenoid is energized and feed-activated again. Then at step C, assuming that a note has been picked (because of correcting the cause of the picking failure) the answer is "no" and at step F the answer is "yes". Now, the thumper must be turned "off" and 95 this is done at step G by dropping the solenoid pin 37 by de-energizing the solenoid 36 at the time shown in Fig. 12 that turns the thumper "off". At step H the question again is asked whether the desired number of documents has been fed. If not, the routine is 100 repeated until the desired number of notes has passed and when this has been determined at step H, the action at step I is to drop or de-energize the solenoid at the time when the armature pin 37 will stop feeding or picking notes.

105 Basically, the same procedure is carried out in picking notes from a stack of new paper money notes, as described in connection with the old note flow chart, Fig. 16. However, when picking new notes, the thumper is turned "off" when a picking failure occurs, 110 and is turned "on" after the failure has been corrected.

Since picking failures occur repeatedly and frequently when picking new notes because of their sticking together in a stack which is held under 115 pressure in a container, it is desirable to maintain the thumper "on" when the supply stack 41 is composed entirely of new notes.

The foregoing description indicates that the thumper is selectively engaged and disengaged by intelligent control to pick notes which would otherwise cause failure in the use of prior art picker mechanism. Prior devices have no selective engagement or 120 disengagement of a plurality of different picking devices which in one mode of operation act in unison but which cannot be used under all circumstances at all times with various kinds, types or conditions of paper money notes.

One of the fundamental aspects of the invention is the switchable thumper. The thumping action of the 130 thumper cannot be used continuously on old or

circulated notes. However, during dispensing without the thumping motion, a note may appear that cannot be picked. It is desired to turn the thumper on at this time to clear the stubborn note, and then to turn the thumper off.

The switchable capability of turning the thumper on and off from one mode to the other renders the ATM more impervious to poor note condition and improper loading of notes in the containers thereof installed in ATM's.

The multi-picker mechanism described can overcome problems that have been encountered with the use of prior art picker mechanisms and enable notes, new or old, to be withdrawn one at a time from sealed, tamper-indicating containers having access openings without the machines being jammed due to a picking failure which could require servicing before proper operation of the ATM can be restored.

In the foregoing description, certain terms have been used for brevity, clearness and understanding but no unnecessary limitations are to be implied therefrom beyond the requirements of the prior art because such terms are used for descriptive purposes and are intended to be broadly construed. Moreover, the description and illustration of the invention is by way of example, and the scope of the invention is not limited to the exact details shown or described.

CLAIMS

1. A multi-picker mechanism for picking notes one at a time from a note supply stack in an ATM housing, comprising a picker housing, primary picker means mounted in the picker housing, secondary picker means mounted in the picker housing and switchably engageable with or disengageable from the primary picker means to pick notes from a note supply stack, and means enabled by the occurrence of a picking failure selectively to engage the secondary picker means with or disengage the secondary picker from the primary picker means to re-establish picking operations.

2. A multi-picker mechanism for picking notes one at a time from a note supply stack in an ATM housing, including a picker housing, primary picker means mounted in the picker housing, secondary switchable picker means mounted in the picker housing, means for operating the primary and secondary picker means in a first mode locked together to pick notes from a note supply stack, means for unlocking the secondary picker means from the primary picker means to operate said primary picker means alone in a second mode to pick notes from said note supply stack, and means for switching said secondary picker means from one mode to the other when a picking failure occurs during operation in said one mode.

3. A multi-picker mechanism as claimed 1 or 2, in which the primary picker means includes suction cup means suction-engageable with an exposed note on the stack, the secondary picker means includes roller means frictionally engageable with said exposed note, and in which the suction cup means, and the roller means when operating, move toward and away from the stack combined with movement parallel with the surface of the exposed note during an

operation of picking of an exposed note from the stack.

4. A multi-picker mechanism as claimed in claim 3 in which the switchable picker roller means includes pivotally mounted arm assembly means, angular probe members at the end of the arm means, and rubber tires rotatably mounted on one-way clutches mounted on said probe members.

5. A multi-picker mechanism as claimed in claim 3 or 4 in which each of the suction cup and roller means is pivotally associated with a plate pivotally mounted in the picker housing, a motor-driven cam is rotatably mounted on a cam shaft in the picker housing to move said plate back and forth on its pivotal mounting to impart movement to the suction cup and roller means toward and away from the stack combined with movement parallel with the surface of the exposed note during picking of an exposed note from the stack.

6. A multi-picker mechanism as claimed in claim 5 in which the suction cup means includes pivotally connected lever members having one end of one lever pivotally mounted on a pivot shaft on which said plate is pivotally mounted, the switchable picker roller means is pivotally mounted on said plate, the cam has a peripheral actuating surface varying in radial distance from its axis of rotation in zones of said peripheral surface, and each of said plate and suction cup means has cam follower means engageable with said peripheral cam surface, whereby the suction cup and roller means are moved toward and away from the stack combined with movement parallel with the surface of the exposed note during picking of an exposed note from the stack.

7. A multi-picker mechanism as claimed in claim 6, in which the primary picker means includes bellows means mounted in the picker housing, and having suction connection with said suction cup means and being connected with said plate so as to be expanded and collapsed during back and forth pivotal movement of said plate.

8. A multi-picker mechanism as claimed in any of claims 1 to 7, in which the secondary picker means includes an arm assembly which is pivotally connected with the primary picker means, and has rubber tires mounted on one-way clutches carried by the arm assembly, such that during engaged operation of the primary and secondary picker means the tires roll in one direction along an exposed note and push against the note, and are held by the clutches against rotation during movement of the tires in a direction opposite said one direction to frictionally engage and pick said note from the stack.

9. A multi-picker mechanism as claimed in claim 8, in which disengageable latch means is provided for preventing rotational movement of the secondary picker means on its pivot connection with the primary picker means during engaged operation of the primary and secondary picker means.

10. A multi-picker mechanism as claimed in any of claims 1 to 8, in which the means for engaging or disengaging the secondary picker means with or from the primary picker means, or said means for switching said secondary picker means from one mode to the other, includes latch means having latch

members mounted on each of the primary and secondary picker means; and in which the latch members are relatively movable between engaged and disengaged positions.

- 5 11. A multi-picker mechanism as claimed in any of claims 1 to 8, in which the means for engaging or disengaging the secondary picker means with or from the primary picker means, or for switching said secondary picker means from one mode to the other, 10 includes latch means to engage or disengage the secondary picker means with or from the primary picker means, and solenoid means for actuating said latch means to switch said secondary picker means between latched and unlatched status with respect to 15 said primary picker means.

12. A multi-picker mechanism as claimed in claim 11, in which the latch means has latch members mounted on each of the primary and secondary picker means and relatively movable between engaged and disengaged positions, and the solenoid means is engageable with the latch member 20 mounted on the primary picker means to move said latch member from engaged to disengaged position and vice versa.

- 25 13. A multi-picker mechanism as claimed in claim 11, in which the latch means includes a latch plate pivotally mounted on the primary picker means movable between latched-on and unlatched-off positions, spring-pressed latch plate control plunger 30 means mounted on the primary picker means engageable with spaced notch means formed on the latch plate to selectively retain the latch plate in either latched-on or unlatched-off position, the latch plate being formed with a latch detent, a latch recess 35 formed on the secondary picker means being engageable with said latch detent to lock the primary and secondary picker means together when the latch plate is in engaged-on position, the latch plate being provided with an actuator arm to move the latch plate 40 between engaged-on and disengaged-off positions, and the solenoid means is mounted in the picker housing and has an armature pin which is projected when the solenoid is de-energized and which when projected engages the latch plate actuator arm when 45 the latch plate is in either engaged-on or disengaged-off positions to reset the latch plate in the other position to switch the secondary picker means from engaged to disengaged status with respect to the primary picker means and vice versa.

- 50 14. A multi-picker mechanism as claimed in any of claims 1 to 13, in which when the note supply stack contains notes of variable age and limpness characteristics randomly arranged in the stack, the enabling means on the occurrence of a picking failure during 55 operation of the primary picker means engages the secondary picker means with the primary picker means to reestablish picking operation and disengages the secondary picker means from the primary picker means when a picking operation has been re-established. 60

15. A multi-picker mechanism as claimed in any of claims 1 to 13, in which when the note supply stack contains new paper money notes the enabling means on the occurrence of a picking failure during operation of the primary picker means and the secondary 65

picker means engaged together disengages the secondary picker means from the primary picker means to re-establish picking operation and re-engages the secondary picker means with the primary picker means when a picking operation has been re-established.

- 70 16. A multi-picker mechanism for picking notes one at a time from a note supply stack in an ATM housing, comprising a primary picker member having a suction type picker cup, a secondary picker 75 member having a rubber tired roll rotatable in one direction only adapted frictionally to engage a note, means for selectively engaging the primary and secondary members for operation in unison or for 80 disengaging the secondary member from the primary member so that the primary member acts alone to pick notes, means for moving said picker members in various directions with respect to the note surface of a note being picked to grip the note surface, to distort 85 its shape, and to dislodge, separate and pull such note from the stack of notes of which it forms a part, and means for controlling the operation of said multi-picker mechanism to switch the mechanism from one of two operative modes to the other and 90 vice versa, depending upon the type of notes being picked, when a picking failure occurs.

17. A picker mechanism for picking notes through an ATM note container access opening one at a time from a note stack held under pressure in said 95 container, including first suction picker means, second friction engageable picker means, lock means for said second picker means movable between locked and unlocked status, respectively to couple the second picker means to or to uncouple the second 100 picker means from said first picker means, means actuated by a picking failure to move the lock means from locked to unlocked status and vice versa depending upon the status of the lock means when picking failure occurs, and means for actuating the 105 first and second picker means and said lock means to pick notes from a note stack.

18. A picker mechanism as claimed in claim 17, in which notes may be picked from note stacks of notes selected from the class consisting of new or circulated notes, in which the first and second picker 110 means are actuated with the lock means in locked status when picking notes from a note stack of new notes and in unlocked status when picking notes from a note stack of circulated notes; and in which the lock means status is switched from the status in which it is 115 operating to the other automatically upon the occurrence of a picking failure.

19. A picker mechanism as claimed in claim 17, in which the means for actuating the first and second 120 picker means and the lock means includes, a) a picker housing; b) bellows means mounted in the housing having suction connection with said first picker means; c) bellows plate means connected with the bellows 125 means pivotally mounted for oscillation on a pivot shaft in said housing; d) means pivotally connecting the first picker means to said bellows plate pivot shaft; e) motor driven rotatable cam means operatively 130 engaging the first picker means and the bellows plate

means to oscillate said bellows plate means to and fro
to expand and collapse said bellows means to supply
suction to said first picker means, and to oscillate said
first picker means toward and away from and along

5 the note stack; and

f) means pivotally mounting the second picker
means and the lock means at spaced locations on the
bellows plate means;

10 and in which the means actuated by a picking failure
includes,

g) a springy actuator strip mounted on the lock
means; and

h) solenoid means mounted in the housing having
armature pin means projected to engage said
15 actuator strip when a picking failure occurs to change
the status of the lock means;

whereby picking operations are re-established.

20. A picker mechanism as claimed in any preced-
ing claim, including sensor means for sensing a
20 picking failure, and in which when a picking failure is
sensed the sensor means actuates said enabling
means to engage or disengage the secondary picker
means.

21. A picker mechanism for picking notes from an
25 ATM note container access opening one at a time
from a note stack held under pressure in said
container, comprising note engageable friction picker
means including a lever arm, a lever pivot shaft, one
end of the lever arm being fixed to said pivot shaft, a
30 plate, means mounting the plate for movement
toward and away from said stack, rubber tired roller
means rotatably mounted on one-way clutch means
on the other end of said lever arm, means pivotally
mounting the pivot shaft on the plate, releasable
35 means for locking the lever arm and pivot shaft
against pivotal movement on the plate, and means
for moving the plate toward and away from said
stack, whereby movement of the plate, when the
lever pivot shaft is locked against pivotal movement
40 on the plate, toward said stack moves said pivot shaft
toward said stack and moves the rubber tired roller
means toward and through said access opening into
the container to press said roller means against the
stack pressure, and then moves the roller means
45 along the stack in one direction along a note to be
picked, and whereby subsequent movement of the
plate away from said stack moves the roller means,
frictionally engaged against the stack pressure with
said note to be picked, in the other direction along the
50 stack to strip said note from the stack and to move
said note out of the container through the access
opening as the roller means moves away from the
stack.

22. A picker mechanism for picking notes one at a
55 time from a note supply stack in an ATM housing,
constructed and arranged and adapted to operate
substantially as hereinbefore particularly described
with reference to and as illustrated in the accompany-
ing drawings.

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